

CLAIMS:

1. An exhaust gas control apparatus for an internal combustion engine, characterized by comprising:

5 a NOx storage reduction catalyst which is provided in an exhaust passage for an internal combustion engine;

concentration detection means whose detection state can be changed between a first detection state in which a total concentration of sulfur oxide and hydrogen sulfide in exhaust gas that has passed through the NOx storage reduction catalyst is detected, and a
10 second detection state in which a concentration of the sulfur oxide in the exhaust gas is detected; and

a controller which performs a poisoning recovery process that controls an operating state of the internal combustion engine such that the sulfur oxide is released from the NOx storage reduction catalyst, wherein

15 the detection state of the concentration detection means is alternately changed between the first detection state and the second detection state after the concentration detection means which is in the second detection state detects release of the sulfur oxide from the NOx storage reduction catalyst during the poisoning recovery process performed by the controller, whereby the concentration detection means obtains the
20 concentration of the sulfur oxide and a concentration of the hydrogen sulfide.

2. The apparatus according to claim 1, wherein the detection state of the concentration detection means is changed between the first detection state and the second detection state at given time intervals.

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3. The apparatus according to claim 1, wherein the detection state of the concentration detection means is changed to the first detection state when it is determined that a range of variation of the concentration of the sulfur oxide that is detected by the concentration detection means is equal to or less than a predetermined value.

4. The apparatus according to claim 1, wherein the concentration detection means includes an oxidation catalyst that has oxidation catalytic activity for the hydrogen sulfide; the concentration detection means which is in the first detection state detects the total concentration of the sulfur oxide and the hydrogen sulfide in exhaust gas that has passed through the oxidation catalyst; and a delay period from when the detection state of the concentration detection means is changed to the first detection state until when the total concentration is detected is set to be longer than a delay period from when the detection state of the concentration detection means is changed to the second detection state until when the concentration of the sulfur oxide is detected.

5. The apparatus according to claim 1, wherein the controller changes the detection state of the concentration detection means to the first detection state or the second detection state according to a state of the NOx storage reduction catalyst during the poisoning recovery process performed by the controller.

6. The apparatus according to any one of claims 1 to 5, wherein when the controller determines that the concentration of the hydrogen sulfide that is obtained by the concentration detection means during the poisoning recovery process exceeds a permissible limit, the controller causes the concentration detection means to remain in the first detection state, the controller controls the operating state of the internal combustion engine such that the sulfur oxide is released from the NOx storage reduction catalyst, an amount of the released sulfur oxide is in a predetermined range, and the concentration of the hydrogen sulfide is reduced, and the controller changes the detection state of the concentration detection means to the second detection state after the total concentration starts to decrease.

7. The apparatus according to claim 6, wherein the controller controls the operating state of the internal combustion engine such that the concentration of the

hydrogen sulfide is reduced, by performing at least one of a process of increasing an exhaust gas air-fuel ratio in a rich air-fuel ratio range, and a process of decreasing a temperature of the NOx storage reduction catalyst in a temperature range in which the sulfur oxide is released.

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8. The apparatus according to any one of claims 1 to 7, wherein when the controller determines that the concentration of the hydrogen sulfide is lower than a permissible limit, the controller controls the operating state of the internal combustion engine such that the amount of the sulfur oxide released from the NOx storage reduction catalyst is increased.

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9. The apparatus according to claim 8, wherein the controller controls the operating state of the internal combustion engine such that the amount of the released sulfur oxide is increased, by performing at least one of a process of decreasing an exhaust gas air-fuel ratio, and a process of increasing a temperature of the NOx storage reduction catalyst.

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10. An exhaust gas control method for an internal combustion engine, characterized by comprising:

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performing a poisoning recovery process that controls an operating state of an internal combustion engine such that sulfur oxide is released from a NOx storage reduction catalyst provided in an exhaust passage for the internal combustion engine,

detecting a concentration of the sulfur oxide in an exhaust gas that has passed through the NOx storage reduction catalyst by a concentration detection means which is in a second detection state during the poisoning recovery process,

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changing a detection state of the concentration detection means between a first detection state in which a total concentration of sulfur oxide and hydrogen sulfide in the exhaust gas and the second detection state after the concentration of the sulfur oxide is detected by the concentration detection means which is in the second detection state,

and obtaining the concentration of sulfur oxide and a concentration of hydrogen sulfide.